

**Remarks:**

Applicants continue to thank the Examiner for his previous indication that claims 1-17 were allowable and that claims 20-25 and 27-32 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants made the required changes and submitted the amendments, in the response filed on February 3, 2004. Applicants were therefore surprised to find that the office action issued on March 16, 2004 rejected all claims. Applicants respectfully traverse these new rejections.

Claims 1-17, 20-25, and 27-32 are pending in this application. The claims are presented as amended in the response filed on February 3, 2004. The Office Action rejects all pending claims under 35 U.S.C. § 101 “because the disclosed invention is wholly inoperative and therefore lacking credible utility.” Office Action at ¶ 2. The Office Action rejects all pending claims under 35 U.S.C. § 112, first paragraph, “as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected to make and/or use the invention.” Office Action at ¶ 3. Applicants respectfully traverse these rejections.

**CLAIM REJECTIONS 35 U.S.C. § 101**

The Office Action rejects all pending claims under 35 U.S.C. § 101 “because the disclosed invention is wholly inoperative and therefore lacking credible utility.” Office Action at 2. Applicant has asserted, in its claimed invention, a specific and substantial utility that is credible. However, the Office opines that the utility is not credible. The Office has, however, failed to establish a *prima facie* showing of no specific and substantial credible utility. The *prima facie* case must establish “that it is more likely than not that a person skilled in the art would not consider credible any specific and substantial utility asserted by the applicant for the claimed invention.” MPEP 2107.II(C)(2); *see also* MPEP 2107.02.IV. “The *prima facie* showing must contain the following elements:

- (i) an explanation that clearly sets forth the reasoning used in concluding that the asserted specific and substantial utility is not credible;
- (ii) support for factual findings relied upon in reaching this conclusion; and
- (iii) an evaluation of all relevant evidence of record, including utilities taught in the

closest prior art.” MPEP 2107.II(C)(2); *see also* MPEP 2107.02.IV. The Office Action does not include these elements.

Moreover, Applicants remind the Office that statements of fact made by an applicant in relation to an asserted utility must be treated as true unless countervailing evidence can be provided that shows that one of ordinary skill would have a legitimate basis to doubt the statement. *See* MPEP 2107.II(C)(2).

The MPEP provides guidelines to determine when an asserted utility is not credible. *See* MPEP 2107.02.III.B. Specifically, an assertion of utility is credible “unless (A) the logic underlying the assertion is seriously flawed, or (B) the facts upon which the assertion is based are inconsistent with the logic underlying the assertion.” *Id.* Independent claims 1, 8, and 14 each recite specific and substantial utilities of reducing intensity of hurricanes. Independent claims 20 and 27 each recite specific and substantial utilities of apparatus used to create bubble plumes to upwell seawater. The logic of these assertions is not flawed and the facts upon which the assertion of utility is based are consistent with the logic.

Consider independent claim 1, which recites:

1. (original) A method of making a reduced intensity hurricane, comprising:
  - positioning a plurality of submersibles in a hurricane interception area, the hurricane interception area describing an area of ocean through which at least a portion of the hurricane’s central core will pass within a predetermined amount of time;
  - maneuvering the plurality of submersibles to a predetermined depth;
  - maintaining the plurality of submersibles in the hurricane interception area at the predetermined depth for the predetermined amount of time; and
  - releasing a gas from the plurality of submersibles after the plurality of submersibles have entered the hurricane interception area, the gas being released during the predetermined amount of time, the gas forming bubbles which rise in a plume toward a surface of the ocean, the plume entraining water from at least the predetermined depth and upwelling the entrained water toward the surface of the ocean to cool the surface of the ocean, the cooled surface reducing the intensity of the hurricane whose portion of central core passes through the hurricane interception area.

The plain meaning of the claim is clear on its face, but to para-phrase, the logic involved requires positioning submersibles in a certain area; maneuvering the submersibles to a predetermined depth; maintaining the submersibles in the area and at the depth for a

predetermined amount of time; and releasing gas to rise in a plume toward the surface, the plume entraining cool water from the depths and bringing it to the surface to cool the ocean surface and thus reduce the intensity of a hurricane. The logic is not flawed. Applicants have asserted facts in the disclosure of the application that show that reduction of sea surface temperatures can reduce the intensity of hurricanes. The disclosure contains sufficient evidence and reasoning to permit a person of ordinary skill in the art to believe the asserted utility. For example:

[0005] Because tropical storms draw their energy from the heat content of the upper ocean, it is generally accepted that a large area of cooled ocean surface can suppress hurricane intensity. Numerical modeling studies at the Massachusetts Institute of Technology suggests that reduction of sea surface temperature by 2.5°C in the storm's central core would eliminate the thermodynamic conditions that sustain hurricanes. Other numerical model studies by independent researchers corroborate these results. In addition, analyses of measurements from past hurricanes show a strong correlation between lack of hurricane intensification and conditions that favor cold-water upwelling by the storm's own winds, such as a shallow thermocline or slow forward speed. Finally, there is clear evidence that hurricanes weaken (or do not intensify under otherwise favorable conditions) when a hurricane crosses the cold "wake" of a previous storm.

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[0007] The physics of natural and artificial hurricane intensity control appear to be governed by sea surface temperature (SST) and the thermal structure (density stratification) of the upper ocean. These influences are combined into a single parameter, Hurricane Heat Potential (HHP), which is used by meteorologists to quantify the heat energy in the upper ocean that is available to fuel a tropical storm. Since SSTs less than 26°C typically cannot support hurricane development, HHP is defined as the heat content in excess of 26°C typically per unit area of the underlying water column between the sea surface and the depth of the thermocline. All such excess heat in this layer of water can be readily mixed from top to bottom by hurricane winds and is thus available to fuel the storm's atmospheric convection. A discussion of the scientific basis for hurricane intensity control, which includes discussions on: formation, development, and features of tropical storm systems; natural processes that limit hurricane intensity; and sea surface temperature and hurricane heat potential; and the definition of hurricane interception regions may be found in section 2.0 of Provisional Application Serial Number 60/253,111 filed November 28, 2000 titled "Method and Apparatus for Reducing the Intensity of Hurricanes at Sea by Deep-Water Upwelling." [incorporated by reference in its entirety]

Applicants reassert the above arguments for independent method claims 8 and 14, which, while being independent and distinct from independent claim 1 rely on similar logic and underlying facts.

In further support of evidence and reasoning to permit a person of ordinary skill in the art to believe the asserted utility, the pending application describes how to calculate the total volume of upwelling water required to weaken a major hurricane. *See* Appln at ¶¶ 0040-53. Note especially the equation given in paragraph 0052, which provides one of skill in the art with the fraction,  $f$ , of the total interception area volume that must be replaced by upwelling water in order to achieve a final layer temperature of 26C in accordance with the example provided. Moreover, the application presents three well-reasoned descriptions of how submersibles could achieve the upwelling required to reduce the intensity of the hurricane: 1) submersibles maneuvering while upwelling (*see* ¶¶ 0054-57); 2) submersibles maneuvering before upwelling (*see* ¶¶ 0058-60); and 3) submersibles targeting half of the storm central core (*see* ¶¶ 0061-64). Each of the three succeeding methods are presented to illustrate the impact of the method on the total upwelling rate required to reduce the intensity of a hurricane. Values of the volume of water to be upwelled are calculated and presented for examination and comparison.

Applicants object to the Office Action's suggestion that a person of ordinary skill in the art would not believe that "the process disclosed either could be implemented or could achieve the asserted useful result, since Applicant has shown no evidence of reducing the speculation and conjecture to practice in either a laboratory or actual environment setting." Office Action at ¶ 2. Applicants point out that it is not required to reduce the invention to practice in order to obtain a patent on the invention. The Office may have inadvertently applied a concept, applicable only to chemical process patents, as set forth by the Supreme Court in its 1966 decision in *Brenner v. Manson*, in reliance of its assertion. *Brenner* is described below and was relied on by the Office for another reason. Moreover, Applicants did provide citation to references in an IDS of patents related to upwelling cold water from the depths of a body of water to reduce the temperature of the relatively warmer surface waters, thus providing evidence that the process could achieve a useful result. *See, e.g.*, USPN 3,683,627 to Girden disclosed in IDS filed January 10, 2002.

Applicants further object to assertion of the Office that "the hurricane disclosed by the Applicant is such a grand scale, in which a process of modifying the grand scale of the hurricane

would take more than the resource realistically available to mankind.” This statement is not made based on the disclosure presented by the Applicants but on preconceived and unsubstantiated notions of the Office. In fact, the application of the present invention provides one example of a limited and quantifiable amount of CO<sub>2</sub> required for one exemplary effort at reducing the intensity of a hurricane. *See* Appln. at ¶ 0102. It is not, as averred by the Office, more than the resource available to mankind.

The Office asserts that the Supreme Court decision in *Brenner v. Manson*, 89 S. Ct. 1033, 148 USPQ 689, 696 (1966) is on point concerning the issue of compliance with the utility requirement of 35 U.S.C. § 101. Applicants disagree. *Brenner* is pertinent only to determine, in the words of Justice Fortas who delivered the opinion of the Court, “what constitutes ‘utility’ in *chemical* process claims.” *Brenner* 383 US 521 (emphasis added). The Court found that in the *chemical* field, until a process is refined to a point in which there is a specific benefit in a currently available form, there is insufficient justification to permit an applicant to monopolize the broad field. *Brenner* at 534-35. The quote cited by the Office in the pending Office Action is dicta, and is taken out of context of the Supreme Court’s decision. The fact remains that *Brenner* is not applicable to the issue at hand where, as shown above, the pending application sets forth the utility of the claimed methods of practicing the invention.

Turning specifically to independent apparatus claims 20 and 27, Applicants note that the Office has failed to provide any discussion concerning these apparatus claims in connection with the pending § 101 rejections. Therefore the Office has failed to establish a *prima facie* showing of no specific and substantial credible utility in their regard. Accordingly, Applicants request withdrawal of the 35 U.S.C. § 101 rejections to independent claims 20 and 27 and their dependent claims 21-25 and 28-32, respectively.

For all the above-stated reasons, Applicants request withdrawal of the 35 U.S.C. § 101 rejections to independent claims 1, 8, and 14 and their dependent claims 2-7, 9-13, and 15-17, respectively as well as independent claims 20 and 27 and their dependent claims 21-25 and 28-32, respectively.

**Claim Rejections 35 U.S.C. § 112**

The Office rejects all pending claims under 35 U.S.C. § 112, first paragraph as containing subject matter that was not described in the specification in such a way as to enable one of skill in the art to which it pertains, or with which it is most nearly connected to make and/or use the invention. Office Action at ¶ 3. The Office presupposes that one of skill in the art would not know how to use the claimed invention. The presupposition is based on the Office's asserted lack of credible utility for the invention. However, as shown above, Applicants assert that the utility of the claimed invention is credible. Moreover, Applicants assert that the words of the claims are clear on their face and that those of skill in the art would know how to make and use the invention.

The specification supports the claims and provides numerous examples of implementations of the invention as claimed. The Office Action provided Applicants with only one example of why it asserted that the claims were not supported by the specification in exact terms. The Office expressed concern over "the grand scale or vast area of the release site." The specification addresses this issue in its discussion of the amount of water required for upwelling. The calculation provided in the specification is given for the most intense Atlantic hurricane as of the filing date of the application, namely, Hurricane Gilbert. The exemplary calculation was based on a region to be cooled being a circle having a radius of 90 km or only about 56 miles. *See* Appln. at ¶ 0043. In another embodiment, the region of the area to be cooled is an area equal to about half the size of the central core. *See* Appln. at ¶¶ 0061-64. It is noted that on or about September 14, 2004, the category five hurricane Ivan in the Caribbean Ocean has a core of about 30 miles. This would leave a region to be cooled on the order of only about 15 miles. Neither the worst case scenario presented as an exemplary calculation in the specification, or the present real-world example of hurricane Ivan, presents a release site that is of such a grand scale or vast area as to be unreasonable for practical application of the claimed invention. The specification therefore feasibly supports the use of the invention to reduce the intensity of hurricanes.

The Office expresses concern over the amount of gas required to affect a hurricane. The specification provides an example of the amount of gas that may be required to upwell a given quantity of water in intercepting a single storm as being approximately 687 million Nm<sup>3</sup>. *See* Appln at ¶ 0102. The application equates this to the amount of greenhouse gas produced by a

500-megawatt coal-fired power plant over approximately a three-month operating period. *See id.* This volume of gas is not unreasonable for use in a practical application of the claimed invention. The gas could be manufactured and stored during none hurricane season. The specification therefore feasibly supports the use of the invention to reduce the intensity of hurricanes.

The Office expresses concern over the number of submersibles required for the process. The number of submersibles is not defined by the specification, but given the equations provided for calculation of upwelling volume of water and examples of the amount of gas required to produce such an upwelling, that one of ordinary skill in the art could calculate the number of submersibles needed based on the gas volume storage capability of each submersible. It is noted that submersibles of the kind required for this application do not presently exist but they are capable of being implemented. The art of submarine manufacture is well established in countries such as the United States, Great Britain, and the former Soviet Union. Thus, the Office's rejection based on lack of feasible support in the specification in exact terms should be withdrawn.

The Office further questions whether the enablement requirement is met by the specification. The standard for determining whether the specification meets the enablement requirement may be determined by asking whether the experimentation needed to practice the invention is undue or unreasonable. However, the fact that experimentation may be complex does not necessarily make it undue or unreasonable. There is no question that in order to bring about a practical working model of the invention as set forth in the claims, that complex experimentation would need to take place. But, Applicants point out that the claimed invention is pioneering in its nature. Nothing like it has been proposed in the past. As such, one would expect there to be a need for complex experimentation. This does not make the experimentation undue or unreasonable.

To support its assertion of undue experimentation, the Office applies several of the factors listed in MPEP § 2164.01(a). Applicants apply the same factors below, with opposite results:

(A) The breadth of the claims:

The claims are not broad and sweeping in scope as asserted by the Office.

Instead, the claims are well defined methods whose results, while apparently considered

impossible by the Office, are nonetheless scientifically feasible and realistically achievable, as presented by the specification;

(B) The nature of the invention:

The nature of the invention is a localized weather change, specifically, the reduction of the intensity of a hurricane. The nature of the invention, and its pioneering status, make it *reasonable* that complex experimentation would be required.

(C) The state of the prior art:

There is no known prior art on point. Based on this observation, complex experimentation would be *reasonable*.

(D) The level of ordinary skill:

The Office characterizes the level of skill as “that of a theoretical scientist dealing in probabilities and possibilities rather than that of an engineer dealing in practical applications of the technology.” Office at p. 4. Applicants point out that the specification provides specific examples, equations, and methodologies for calculations of upwelling volume. *See* Appln. at ¶¶ 0040-64. Therefore, an engineer, dealing in the practical applications of the technology, could implement apparatus to practice the claimed methods. Nonetheless, and because of the pioneering status of the application, substantial experimentation would be reasonable.

(E) The level of predictability of the prior art:

As stated above, there is no known prior art on point. Therefore, the level of predictability cannot be determined. However, this does not mean that the outcome of the claimed invention is unpredictable, as asserted by the Office. To the contrary, the specification provides evidence that hurricanes gain energy from warm waters and conversely lose energy when they encounter cool surface waters. *See* Appln. at ¶ 0005. Accordingly, implementation of the claimed methodology would indicate a predictable reduction in the strength of the hurricane being acted upon.



(F) The amount of direction provided by the inventor:

The specification is complete with detailed descriptions of various gas sources (*see, e.g.*, para 0029), submersible designs (*see, e.g.*, para 0034), interception strategies (*see, e.g.*, 0026-27, 49-64), and provides an example of the calculation of upwelling volume required for successful surface water cooling (*see, e.g.*, 0049-64).

(G) The existence of working examples:

Examples may either be prophetic or working. Prophetic examples describe embodiments of the invention based on predicted results rather than on work actually done. The Office states that the application is devoid of working examples, however, this cannot be held against Applicants. The specification need not contain an example if the invention is otherwise disclosed in such manner that one skilled in the art will be able to practice it without an undue amount of experimentation.” MPEP 2164.02; *In re Borkowski*, 422 F.2d 904, 908, 164 USPQ 642, 645 (CCPA 1970). As stated herein, given the pioneering nature of this application, the amount of experimentation required to implement the invention would not be considered undue.

(H) The quantity of experimentation needed to make or use the invention based on the content of the disclosure:

The disclosure includes descriptions of gas liberation sources (*see, e.g.*, para 0029), gas delivery vehicles (*see, e.g.*, para 0034), interception strategies (*see, e.g.*, 0026-27, 49-64), and examples of calculations of upwelling volume (*see, e.g.*, 0049-64), etc. The application is, however, pioneering in nature, as such the quantity of experimentation required may be substantial, which is not to say that the amount is undue or unreasonable. The Office, however, characterizes the quantity as astronomical, citing lack of background information, past experiment, and specific detail. Applicants assert that background information is provided, past experiment is not required, and specific detail is provided in the form of well reasoned interception strategies and calculations of upwelling volumes required for each strategy.

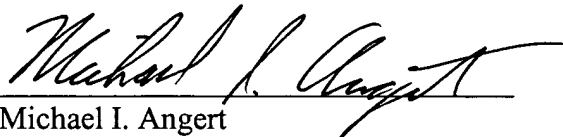
For all of the above stated reasons, Applicants respectfully request withdrawal of the rejections of all pending claims under 35 U.S.C. § 112, first paragraph. Further, as stated above, Applicants also respectfully request withdrawal of the rejections of all pending claims under 35 U.S.C. § 101.

The claims are allowable for the reasons set forth above. A Notice to that effect is respectfully requested.

The Office is hereby authorized to charge all required fees or credit any overpayments to Deposit Account 11-0600.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Michael I. Angert", is written over a horizontal line.

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